

## MAKING THE CUT\*

Clifton Pye and Yin-Yin Pao

University of Kansas

We have been exploring the acquisition of the causative alternation for a number of years. The causative alternation expresses the presence or absence of an external controller (Levin & Rappaport Hovav 1994). This is evidenced in the distinction between 'I broke my computer' and 'My computer broke'. The first sentence expresses the role of an external controller (me) that caused the action to take place. The second sentence expresses the result of that action without implying a cause.

Many English verbs do not undergo the causative alternation. One such exception is the verb *cut*. The sentence 'I cut the cloth' is acceptable, but not the sentence 'The cloth cut'. Such exceptions create a serious learnability problem for children acquiring English - how to differentiate between the verbs that undergo the causative alternation and the verbs that do not. Children could not use positive evidence from the input language to learn such restrictions because positive evidence only indicates that a general rule for the causative alternation is available in English - not that there are exceptions to it. There is no evidence that parents offer any overt correction to children who overgeneralize the causative alternation to verbs such as *cut*. Children do eventually turn into adult speakers with this restriction so the question is how did they learn the restriction?

One possibility is that children take a conservative approach to language and only produce what they hear in the language around them (Baker 1979). Such children would receive positive evidence that verbs such as *break* alternate since they would hear other speakers using these verbs in transitive as well as intransitive sentences. They would not hear themselves. The one difficulty with the conservative learning approach is that we do hear children producing such sentences as 'The paper cut', that is overgeneralizing beyond the input to them (Bowerman 1974; Pye et al. 1994). So conservative learning does not account for the acquisition of the causative alternation.

Another solution would be to assume the distinction is innate. In this scenario children would be genetically equipped with the knowledge that the causative alternation is only applicable to a particular range of verbs. The lexical restrictions on such rules would be part

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of universal grammar. This solution predicts that children would not make any mistakes, so it has the same problem that conservative learning has. Innate constraints also predict that all languages would have similar restrictions on such rules. Since Chinese and the Mayan language K'iche' (to name two) allow a verb cut to alternate in the same manner as their verb break, the UG explanation does not reflect actual language facts. So innate constraints will not explain the acquisition of the causative alternation.

One solution that has received the most attention in the linguistics and language acquisition literature is to propose semantic distinctions that account for the differences in the syntactic behavior of verbs (Grimshaw 1990; Hale & Keyser 1986; Levin & Rappaport 1994; Pinker 1989). The problem with semantic solutions is that they substitute semantic make believe for syntactic precision. Figures 1 and 2, for example, display typical semantic analyses for break and cut (from Ravin 1990). These analyses follow Hale & Keyser (1986) in ascribing an extra contact component to the meaning of cut. Ravin links the contact component in cut to an Agent exerting physical effort. Note that apart from this component the semantic analysis of cut is similar to the analysis of break.

The problem is that such analyses are not satisfactory semantic descriptions. Paraphrasing cut as 'breaking by applying an edge across an object' is ludicrous. Ravin has to specify some type of change in the condition of an object to distinguish break from a verb like move. Such a representation errs in being too specific regarding the final state of the object since many broken objects are not divided into pieces, e.g. a broken computer or a broken leg. At the same time the representation errs in not being specific enough in that it does not distinguish between break and sever, where sever implies breaking into pieces. Without independent evidence for their constituent semantic features such analyses offer little advantage over an index marking verbs that undergo the causative alternation. The representations themselves are semantically unmotivated.

A problem for semantically motivated syntactic verb subgroups is the variable syntactic behavior of verbs in different syntactic contexts. Radford (1988) provides an example of this problem in his textbook on syntax. It revolves around the issue of why breaking a promise, breaking the news, breaking the law, and breaking a lease all sound acceptable in transitive contexts while it is only possible to use news breaking in an intransitive context ('The news broke on the unsuspecting inhabitants'). Such behavior remains a mystery in an analysis that attributes syntactic restrictions to the semantic components of verbs (c.f. Goldberg 1992).

The most severe problem such semantic analyses face is the fundamental inadequacy of feature theory as a tool for semantic analysis. Semantic features go back at least as far as Aristotle's *De interpretatione*. Feature theories come in various forms from the classical form to more modern prototype and exemplar forms. They all have in common the belief that meaning can be broken into a basic set of constituent atoms and that these semantic atoms, or features, account for word meaning (Fodor 1983).

Figure 1. (Ravin 125)

break

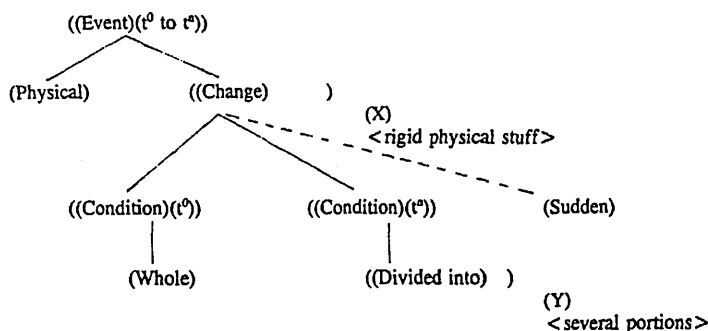
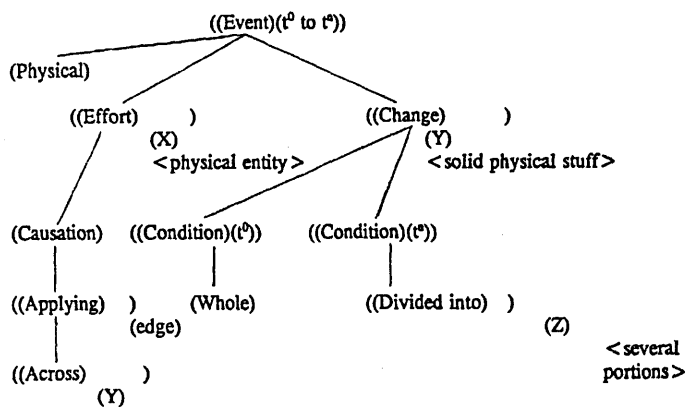
X--[subject]    (Y--[object of *into/in/to*-PP])

Figure 2. (Ravin 214)

cut

X--[subject]    Y--[object]    (Z--[object of *into/in/to*-PP])

Feature theories are inadequate at many levels. They predict sharp distinctions in word meaning that do not match our intuitions. (Compare *break*, *sever* and *fracture*, or *rip* and *tear*.) Feature theories imply that all speakers share similar semantic representations for the words in their lexicon. Putnam (1990) has pointed out that linguistic communities instead rely upon experts to distinguish elms from beeches, gold from bronze, or fractionating from titrating. Evidently our reliance upon such experts does not stop us from using such words in everyday communication. Feature theories do not supply an adequate account for semantic change and cultural evolution. Again Putnam (1990) has noted that water is much the same for us and the ancient Greeks, notwithstanding several thousand years worth of accumulated chemical wisdom. The irony is that so many generative grammarians ascribe to some form of feature theory when feature theories are incapable of capturing the generative capacity of the semantic component.

The most difficult problem for semantic feature theories is learnability. How are children supposed to determine the semantic features associated with each word in the language? This problem was originally raised by Quine (1960) in the context of his discussion of radical translation. Quine used the situation of a linguist faced with the difficulty of translating the native word *gavagai* as his prime example of radical translation. He has been taken to task ever since by linguists who fail to comprehend the seriousness of the problem (Katz 1990). The problem obviously exists for children who do not have access to a translation manual between the language of their community and their own prelinguistic cognitive systems. Quine took the radical step of theorizing that children never wind up with the same meanings for words, maintaining that meaning by its very nature is indeterminant. In other words, none of us would agree on the exact range of referents for most words.

The breaking domain provides clear evidence to support Quine's indeterminacy thesis. It is obviously impossible to envision how every object will break. There are, hopefully, an infinite number of objects to be made from an infinite number of substances yet to be invented. None of us can say whether such objects will break, fracture, tear, or decompose. Without a shared experience of such objects our linguistic community cannot agree ahead of time on which ones will break.

Different linguistic communities have had time and opportunity to divide the breaking domain in different ways. The Mayan language K'iche' provides a good example of the crosslinguistic variation to be found within this domain (see Appendix), e.g.

- chiko:j/-chikoxik [to break by throwing the object itself, e.g. chest, stool, pot]
- ch'akati:j/-ch'akatixik [to break off a small piece, e.g. bread to feed hens]
- etzalob'a:j/-etzalob'ik [to break down; ruin, e.g. computer, car, zipper]
- jochopi:j/-jochopinik [to break a banana by failing to support the whole bunch]
- joyopi:j/-joyopinik [to break a banana from a bunch of bananas]
- paxi:j/-paxik [to break clay, rock, e.g. glass, plate, cup, rock, pot]
- pitz'itz'e:j/-pitz'itz'exik [to crush something soft, e.g. clay]
- pi'i:j/-pi'inik [to break something soft, e.g. book, tortilla, clay, hardboiled egg; to split or break hair, plate; to divide, e.g. road]
- qasa:j/-qajik [to descend; to break in a downward fashion, e.g. arm, leg, stick, tree]

- q'upi:j/-q'upinik [to break something hard, e.g. bridge, dam, candle, basket, stick, chair, tooth]
- raqi:j/-raqinik [to smash something hollow, e.g. glass, pot, plate, chest, bubble]
- t'oqopi:j/-t'oqopinik [to sever something long and flexible, e.g. rope, wire, string; to pluck hair]
- weqi:j/-weqinik [to smash something hard, e.g. pot, wall, stone griddle, mile post]
- woqi:j/-woqinik [to shatter something fragile, e.g. eggs, vase, lightbulb]

Such distinctions indicate that the English word *break* is far from a simple lexical expression of our underlying perception of events. There is no reason to consider its meaning to be especially transparent for children. Children learning English have to eliminate all the semantic distinctions that children learning K'iche' are forced to make. Nor is it simply a matter of eliminating restrictions since languages such as Korean or Winnebago impose entirely different sets of distinctions.

Perhaps a small demonstration is in order. It is surprisingly easy to invent new things to break and new ways of breaking them. Our experiments have investigated the role of the object, instrument and result in the distinction between breaking and cutting. Our objects include playdoh, peanuts, crackers, paper and dental floss. Our instruments include hands, rulers, scissors, string and a pencil. Finally, our actions include a scissors action with the hand and a cutting action with the ruler and string. We have carried out this experiment with both children and adults. Their responses are shown in tables 1, 2 and 3.

The group data does not begin to do justice to the individual variation to be found in such a task. A comparison of individual responses for the children and adults reveals a great deal of variation between the individual child and adult responses. The children show more variation than the adults, but there are still significant differences between adults in the types of actions they consider to be breaking or cutting. These results support Quine's thesis in that there is a great deal of variation between individual children and adults. We did not find anything like universal agreement on what constitutes an act of breaking versus cutting or tearing. Whatever concepts children and adults use to make such distinctions do not lead to a unanimity of opinion concerning these novel actions. There is no evidence that English speakers resort to particular semantic features when extending verbs to novel actions.

The results are compatible with an interpretation in which speakers construct their own theories of word meaning. Each individual must decide which attributes of a situation constitute defining elements for the word *break*. Our theories of word meaning evolve as we encounter more evidence of the scope of word usage. Our theories may change as our evidence changes, reflecting changing patterns of usage in our linguistic communities. Changes in meaning are independent of changes in verb subcategorization. Verbs are free to enter causative alternations or not depending on accidents of history. There is ample evidence of such change in English (Visser 1963).

This still leaves the original problem of how children decide to restrict the causative alternation to particular verbs. I think the best solution lies along the lines of paradigm construction. Pinker proposed paradigm construction as a means children could use to

Table 1. Percentage of children (adults) responding with break\*.

% break	hand	ruler	scissors	string	pencil
playdoh	1.0 (.23)		.16 (-)	.5 (-)	.67 (.23)
peanut		.67 (.5)	.33 (.04)		
cracker		.67 (.41)		.5 (.59)	.67 (.68)
paper	.5 (-)	.33 (-)	.16 (-)	.33 (-)	.33 (-)

\*6 children/22 adults (shown in parentheses)

Table 2. Percentage of children (adults) responding with cut\*.

% cut	hand	ruler	scissors	string	pencil
playdoh	- (-)		.67 (1.0)	.5 (.95)	.16 (.04)
peanut		.16 (.5)	.67 (.95)		
cracker		.16 (.59)		.16 (.32)	.16 (.27)
paper	.16 (.27)	- (.18)	.84 (1.0)	- (.18)	.16 (-)

\*6 children/22 adults

Table 3. Percentage of children (adults) responding with tear\*.

% tear	hand	ruler	scissors	string	pencil
playdoh	- (.23)		.16 (-)	- (.04)	.16 (.73)
peanut		- (-)	- (-)		
cracker		.16 (-)		.16 (.09)	- (.04)
paper	.33 (.73)	.67 (.82)	- (-)	.67 (.82)	.5 (1.0)

\*6 children/22 adults

acquire inflections (1984). Children presumably note the formal similarities and differences between the words *play/played*, *jump/jumped* and *break/broke*, to construct a paradigm for the regular and irregular past tense inflection. Children overgeneralize the regular past tense inflection -ed to the irregular verbs until they realize that the irregular past tense forms displace the regularized forms (c.f. Marcus et al. 1992).

A similar solution suggests itself for the acquisition of the causative alternation (c.f. Lord 1979). Children could construct paradigms for intransitive and transitive uses of verbs on the basis of positive evidence, e.g.:

intransitive	NP2 break	NP2 open	NP2 tear
transitive	NP1 break NP2	NP1 open NP2	NP1 tear NP2

Such subcategorization information is part of the lexical entry for verbs and therefore available for the construction of verbal paradigms. In languages that contain overt causative inflections, such as K'iche', children presumably construct causative paradigms for the affix in the same way they construct paradigms for tense or aspect.

Paradigm construction would capture the acquisition of suppletive causative pairs in exactly the way it accounts for the acquisition of irregular past tense forms. At first, children would fail to realize that *die/kill*, *come/bring*, *eat/feed*, *stay/keep*, etc. form a suppletive relation with respect to the causative alternation. Children that failed to observe this relation would be tempted to extend the intransitive verbs to transitive contexts and vice versa. Roughly 90 percent of children's causative overgeneralizations involve such suppletive pairs, so paradigm construction would explain a major proportion of children's errors with the causative alternation.

One difficulty for a paradigm account are verbs with fixed transitivity and no suppletive partners. Intransitive verbs such as *disappear*, *glimmer* and *shiver*, and transitive verbs such as *cut*, *put* and *throw* do not have a lexical means to express an event in another transitivity perspective. They require a syntactic device such as the periphrastic or passive constructions to alternate transitivity. At first glance, such syntactic constructions appear to be outside the scope of lexical paradigms, but Williams (1994) suggests otherwise. He notes that adjectives have a paradigm that mixes inflectional and syntactic constructions, e.g.

regular	simple	simpler	simplest
suppletive	good	better	best
syntactic	regular	more regular	most regular

The lesson Williams draws from such examples is that the lexical entries may contain more syntactic information than the individual part of speech. Significantly, this additional information includes phrasal constructions that the word appears in. The exceptional causative paradigms would then include entries like the following:

intransitive	NP2 disappear	NP2 was cut
transitive	NP1 make NP2 disappear	NP1 cut NP2

As an explanation for language acquisition, paradigm construction has the obvious advantage that it makes no distinctions between lexical, suppletive, morphological and phrasal alternations. Languages are free to use any of these means to express the causative alternation and do. Indeed, languages like English and K'iche' use multiple means to express the causative alternation. Paradigm formation also explains children's overgeneralizations in a uniform manner. A significant prediction may be that all such errors of commission, as opposed to errors of omission, may be attributed to an insufficiently structured lexicon. Finally, paradigm formation avoids the problem of semantic indeterminacy. In fact, semantic indeterminacy may explain why children have difficulty constructing paradigms for suppletive and phrasal forms in the first place. They would not be able to use lexical form as a guide to semantic similarity and would then require some experience with the forms to determine that they form a paradigm.

Paradigm construction is not a perfect explanation for the acquisition of the causative alternation. One significant problem is that paradigm formation would not account for the degree of crosslinguistic similarity in the words that use lexical and morphological forms to express the causative alternation (Nedjalkov & Silnitsky 1973). Differences between Chinese, English and K'iche' demonstrate that such similarity is merely a statistical trend rather than a rule of universal grammar. As such, we may attribute such accidental similarities to processing needs (Zipf 1935).

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## APPENDIX (K'iche' Breaking Verbs)

- chiko:j/-chikoxik [to break by throwing the object itself, e.g. chest, stool, pot]
- chup/-chupik [to snuff out something, e.g. candle, light; to erase marks]
- ch'akati:j/-ch'akatixik [to break off a small piece, e.g. bread to feed hens]
- ch'ol/-ch'o:lik [to peel, e.g. fruit, vegetables, animals, skin]
- ch'up/-ch'upik [to pick large fruit, e.g. peaches, pineapples, melons]
- b'oq/-b'oqik [to pick a plant from the ground, roots and all, e.g. onions]
- etzalob'a:j/-etzalob'ik [to break down; ruin, e.g. computer, car, zipper]
- jach'/-jach'ik [to pick corn, e.g. the cob, the ear, the kernels, the husk]
- jisi:j/-jisinik [to crack, slit, e.g. glass, paper; to operate on someone]
- jixi:j/-jixinik [to tear leaves along the veins]
- jochopi:j/-jochopinik [to break a banana by failing to support the whole bunch]
- jok'/-jok'ik [to grind, e.g. lime, rice, wheat]
- jol/-jolik [to pull entire leaf and part of stem from corn in a downward motion]
- joyopi:j/-joyopinik [to break a banana from a bunch of bananas]
- kabiq/-kabiqik [to shell corn by twisting the cob in one's hands]
- ke'e:j/-ke'exik [to grind corn]
- k'et/k'etik [to shell corn with one's thumb - imitating a hen pecking corn]
- mak/-makik [to pick small beans, e.g. coffee, beans]
- mich'/-mich'ik [to chop, e.g. plants; to pluck, e.g. feathers, pine needles]
- pachale:j/-pachalexik [to smash something with one's foot]
- paq'i:j/-paq'inik [to split, e.g. boards, watermelon, balloon]

- paxi:j/-paxik [to break clay, rock, e.g. glass, plate, cup, rock, pot]
- pitz'itz'e:j/-pitz'itz'exik [to crush something soft, e.g. clay]
- pi'i:j/-pi'inik [to break something soft, e.g. book, tortilla, clay, hardboiled egg; to split or break hair, plate; to divide, e.g. road]
- pich'i:j/-pich'inik [to squash bugs, e.g. lice, fleas, worms]
- poq'i:j/-poq'ik [to pop, e.g. bubble, balloon; to explode, e.g. bomb]
- qasa:j/-qajik [to descend; to break in a downward fashion, e.g. arm, leg, stick, tree]
- q'ipi:j/-q'ipinik [to chip; to make smaller, e.g. mug, roll up pants legs, break sticks across one's knee for kindling]
- q'ol/-q'olik [to pick leaves by tearing across the base of the leaf, e.g. picking flowers, leaves to wrap tamales and tortillas]
- q'upi:j/-q'upinik [to break something hard, e.g. bridge, dam, candle, basket, stick, chair, tooth]
- rach'aqi:j/-rach'aqinik [to tear, e.g. pants, cloth, paper]
- raqi:j/-raqinik [to smash something hollow, e.g. glass, pot, plate, chest, bubble]
- sak'i:j/-sak'inik [to crack, e.g. wall, melon, pot, plate, glass, skull, tree, board]
- t'oqopi:j/-t'oqopinik [to sever something long and flexible, e.g. rope, wire, string; to pluck hair]
- t'ub'i:j/-t'ub'inik [to tear, e.g. paper, clothes]
- weqi:j/-weqinik [to smash something hard, e.g. pot, wall, stone griddle, mile post]
- woqi:j/-woqinik [to shatter something fragile, e.g. eggs, vase, lightbulb]
- xul/-xulik [to pick something by the stem, e.g. grapes]
- yoji:j/-yojinik [to dismantle something, e.g. table, bed, house, car]
- yokoke:j/-yokokenik [to crumple something, e.g. aluminum cans, paper cups]



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